



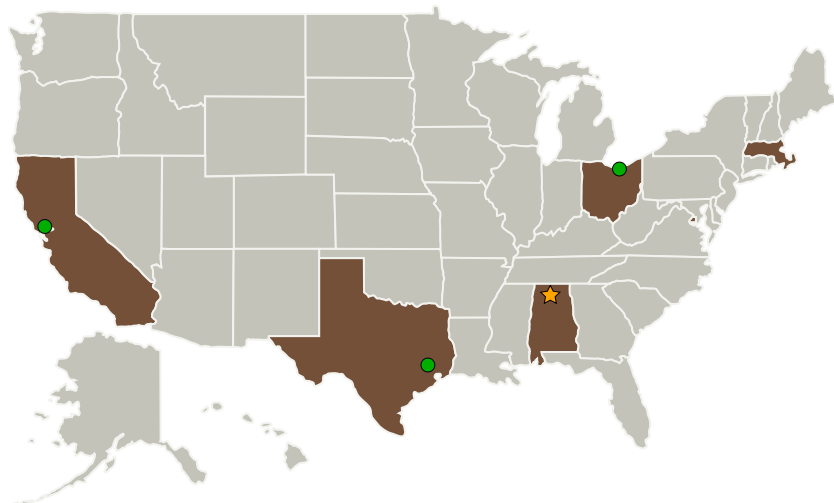
Project Introduction

The Advanced Exploration Systems (AES) Life Support Systems project Oxygen Generation and Recovery technology development area encompasses several sub-tasks in an effort to supply oxygen to the crew at the required conditions, to recover oxygen from metabolic carbon dioxide, and to recycle recovered oxygen back to the cabin environment. These technologies are under consideration for future deep-space missions. The project is developing technologies to provide high-pressure oxygen either through high-pressure water electrolysis; using low-pressure electrolysis then drying, purifying, and compressing; and through solid-state oxygen separation, then drying, purifying, and compressing. The project is developing a technology to deliver low-pressure oxygen using the Bosch chemical process. The project is developing a technology to increase oxygen recovery using methane pyrolysis and hydrogen separation to recover hydrogen from methane, combine the hydrogen with carbon dioxide to produce water, and then use electrolysis to separate oxygen from the hydrogen.

Anticipated Benefits

The technologies developed in this project are being developed to improve on the state-of-the art used on the International Space Station or to develop new technologies required for deep-space missions and that are not needed on the International Space Station. These technologies can be used on deep-space exploration, including Mars missions.

Primary U.S. Work Locations and Key Partners



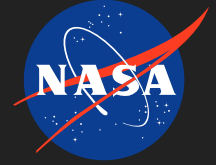
AES Life Support Systems

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Life Support Systems: Oxygen Generation and Recovery

Active Technology Project (2014 - 2024)



Organizations Performing Work	Role	Type	Location
★ Marshall Space Flight Center(MSFC)	Lead Organization	NASA Center	Huntsville, Alabama
● Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California
Giner Electrochemical Systems, LLC	Supporting Organization	Industry	Newton, Massachusetts
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio
Honeywell International	Supporting Organization	Industry	
Jacobs Engineering Group, Inc.	Supporting Organization	Industry	Dallas, Texas
● Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas
JSC Engineering, Technical, and Science(JETS)	Supporting Organization	Industry	Texas
UMPQUA Research Company	Supporting Organization	Industry	Myrtle Creek, Oregon
University of California-Berkeley(Berkeley)	Supporting Organization	Academia	Berkeley, California
Wyle Laboratories, Inc.	Supporting Organization	Industry	

Organizational Responsibility

Responsible Mission Directorate:

Exploration Systems Development Mission Directorate (ESDMD)

Lead Center / Facility:

Marshall Space Flight Center (MSFC)

Responsible Program:

Exploration Capabilities

Project Management

Program Director:

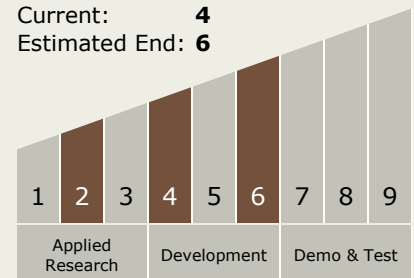
Christopher L Moore

Project Manager:

Walter F Schneider

Technology Maturity (TRL)

Start: 2
 Current: 4
 Estimated End: 6



Life Support Systems: Oxygen Generation and Recovery

Active Technology Project (2014 - 2024)



Primary U.S. Work Locations

Alabama	California
District of Columbia	Massachusetts
Ohio	Texas

Images



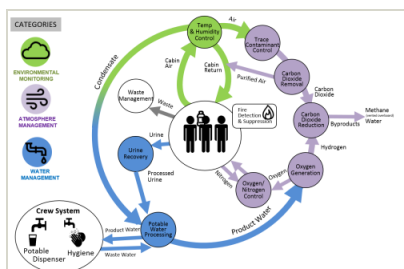
AES Life Support Systems

AES Life Support Systems
(<https://techport.nasa.gov/image/143411>)



High Pressure Oxygen Generator Test Stand

High Pressure Oxygen Generator
Test Stand in Assembly
(<https://techport.nasa.gov/image/143412>)



ECLSS Loop Closure Cycle

ECLSS Loop Closure Cycle
(<https://techport.nasa.gov/image/143410>)

Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
 - TX06.1 Environmental Control & Life Support Systems (ECLSS) and Habitation Systems
 - TX06.1.1 Atmosphere Revitalization

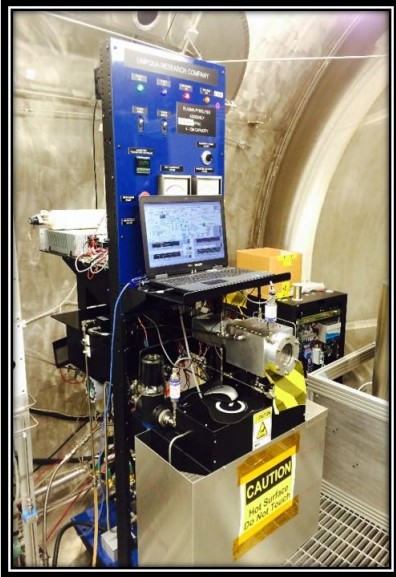
Target Destinations

Earth, The Moon, Mars

Supported Mission

Type

Projected Mission (Pull)



Plasma Pyrolysis Test

Hardware

Plasma pyrolysis hardware
processing methane

(<https://techport.nasa.gov/image/143414>)